



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : James R. Kittrell Confirmation No. 3692
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FURTHER DECLARATION UNDER 37 C.F.R. 1.132

JAMES R. KITTREL, hereby declares as follows:

That, he is the inventor of U.S. Patent Application Serial No. 09/684,173 filed October 6, 2000 for a TWO STAGE PROCESS AND APPARATUS FOR PHOTOCATALYTIC AND CATALYTIC CONVERSION OF CONTAMINANTS;

That, he is intimately familiar with and has read the subject matter of U.S. Patent 6,086,749, applied by the Examiner in the Examiner's Office Actions dated November 9, 2005, and he does not believe that said references taken alone or in combination teach, suggest or make obvious the invention claimed in the above-identified application;

That, the catalyst support composition claimed in the above-identified application exhibits superior catalyst activity when compared to the hydrotreatment catalysts disclosed in the

cited prior art reference, particularly with respect to converting contaminants in a gas stream;

That, the teachings of the prior art fails to suggest or appreciate the criticality of the combination of silica, titania and tungsten oxide in the catalyst support for improving the removal of contaminants from a gaseous stream; and

That, the teachings of the prior art references fail to suggest or appreciate the criticality of silica to the catalytic activity in combination with tungsten oxide and titania;

That, as evidence supporting the foregoing unexpected results, Declarant offers the following comparative test results to demonstrate the criticality of silica in combination with titania and tungsten oxide on catalyst activity.

A previous declaration has been filed which describes methods of manufacture and compositions of catalysts which correspond to the claims of the disclosed invention. That previous declaration disclosed the results of catalysts of the disclosed invention which exhibited a composition near the lower end of the claimed range of silica content.

In the present declaration, exceptional catalyst performance is disclosed with similar catalyst preparations near the higher end of the claimed range of silica content.

An impregnated catalyst (Catalyst 1) was prepared by forming a solution of 17.5 g. silicotungstic acid hydrate and 70

ml of deionized water. The solution was used to impregnate a 50g of mixture of finely ground titania and silica. The impregnated catalyst was dried and calcined at a 450 °C terminal temperature. The impregnated catalyst was then crushed and sieved. Tetraamine platinum nitrate was then added in the amount necessary to achieve an approximate 1% platinum loading. The impregnated catalyst was dried and calcined at a 400 °C terminal temperature.

A second catalyst (Catalyst 2) was prepared by forming a solution of 25.7g sodium tungstate and 108 ml of deionized water. The solution was used to impregnate 60g of finely ground titania. The impregnated catalyst was dried and calcined at a 450 °C terminal temperature. The impregnated catalyst was then crushed and sieved. Tetraamine platinum nitrate was then added in the amount necessary to achieve about 1% platinum loading. The impregnated catalyst was dried and calcined at a 400 °C terminal temperature.

Each catalyst was placed individually into a tubular reactor having an outer diameter of 15.8mm. A typical reactor charge of catalyst, crushed and sieved, was 10-15cc. The temperature of the reactors was controlled by a PID micro mega controller. Each reactor had an arrangement for the introduction of the air stream containing organic contaminant and the removal of the purified air stream.

Air was supplied to the reactors by an air compressor. All or a portion of the air could be diverted through a saturator to add tert-butyl methyl ether (MTBE) to the flowing air stream to obtain the desired reactor inlet concentration. The temperature of this jacketed saturator was controlled by circulation through the jacket of a glycol stream from a temperature controlled Lauda Refrigerating Circulator Bath. By control of the saturator air flow rate and the saturator temperature, any desired concentration of contaminant can be achieved in the main air flow stream to the catalytic reactor. The total air flow to the reactor was maintained by a flow controller.

An air stream at about 25°C, containing about 10 ppm of MTBE at about 25% relative humidity, was introduced into each reactor at about 1 atm. pressure and passed through the reaction zone. In one reactor, approximately 10 cm³ of Catalyst 1 of a size range of 8 to 12 mesh was inserted in the reaction zone of the glass reactor. In the second reactor, approximately 15 cm³ of Catalyst 2 of a size range of 8 to 12 mesh was inserted into the reaction zone of the reactor. At steady state, the reactor outlet was analyzed for the concentration of unreacted MTBE.

The results are as follows:

Catalyst	Tungsten Oxide, Wt %	Silica, Wt %	Titania, Wt %	Catalyst Activity, min ⁻¹	Space Velocity Hours ⁻¹	MTBE Conversion, %	Reaction Temperature, °C
Catalyst 1	16.25	37.3	46.4	2692	129,000	71.4	60
Catalyst 2	23.44	0	69.3	20	16,000	7.1	59

The results are surprising, and show that there is an extremely strong dependence of catalyst activity on the relative amounts of silicon and titania in the catalyst. It is clear that the presence of silica is necessary for an extremely high catalyst activity. The catalyst of present invention contains silica, tungsten oxide, titanium, oxygen, and platinum. With five components, it is not possible to predict, or even to determine by routine experimentation, the proper combination of the amounts of each of these five constituents, particularly when such changes in composition of silica cause such large effects on catalyst performance.

A previous declaration has shown that high activity catalysts can be developed by the present invention at low levels of silica in the catalyst.

The foregoing test data clearly establishes the criticality of the claimed catalyst support composition of the present invention on catalyst activity. The sum total teachings of the cited prior art documents does not appreciate the advantages obtained by providing a catalyst composition of the independent claim nor the benefits obtained on catalyst activity resulting

from even small amounts of silica in combination with titania and tungsten oxide.

The undersigned declare further that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

7/27/06
Date

James R. Kittrell
James R. Kittrell
PRESIDENT
Name and Title